Environmental Resources Management, inc.

855 Springdale Drive • Exton, Pennsylvania 19341 • (215) 524-3500 • Telex 4900009249

15 February 1989

Ms. Janet Feldstein
U.S. Environmental Protection Agency
Region II
Emergency and Remedial Response Division
Room 737
26 Federal Plaza
New York, NY 10278

File No: 802-01-00-01

Dear Janet:

Enclosed for your use and review is the Work Plan for the Feasibility Study/First Operable Unit of the SCP/Carlstadt Site. Four additional copies are included for your use. The Work Plan for the FS/FOU dated 15 February 1989, supersedes the Work Plan dated 16 December 1988.

If you have any questions/comments, please contact Mr. Gil Weil at (201) 563-5905, or me at (215) 524-3521. Thank you.

Sincerely,

Marian E. Donovan Carlin

Marian E. Donovan Carlin
Project Manager

MEDC/jkp

Enclosures

cc: Pam Lange (3 enclosed)
Harry Yeh (2 enclosed)
Gil Weil (enclosed)
Ron Fender (enclosed)
Bill Warren
Susan Hoffman (enclosed)

FEASIBILITY STUDY WORK PLAN
FOR THE FIRST OPERABLE UNIT
SCIENTIFIC CHEMICAL PROCESSING SITE
CARLSTADT, NEW JERSY

15 February 1989

Ronald G. Fender
Project Director

Marian Donovan Carlin
Project Manger

Prepared By:

Environmental Resources Management, Inc.
855 Springdale Drive
Exton, Pennsylvania 19341

FILE NO. 802-01-00-01

The ERM Group

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SECTION 1

INTRODUCTION

1.1 Scope and Objectives of This Feasibility Study for the First Operable Unit

This document is a Work Plan for the Feasibility Study (FS) to be conducted for the remediation of on-site sources at the Scientific Chemical Processing Site in Carlstadt, New Jersey (SCP/Carlstadt site). It is designed to identify and evaluate source control alternatives for the remediation of the first operable unit (on-site sludges, surface soils above the clay, and shallow ground water).

A number of information sources including journal articles and vendor literature will be used to evaluate remedial technologies. Sufficient information is available to evaluate a number of remedial technologies; however, there are certain innovative, emerging, or highly site-dependent technologies for which available information is not adequate to complete these evaluations without treatability testing. Part of the Feasibility Study/First Operable Unit (FS/FOU) will include treatability studies of limited scope on at least three remediation technologies. These treatability studies will be performed to help assess the feasibility, practicality and effectiveness of various source control remedial technologies. The technologies investigated in these studies may or may not become part of the remedial alternative(s) recommended at the conclusion of the FS/FOU. The remedial alternatives evaluated in the FS/FOU may consist of more than one remedial technology. The scope of these treatability studies is provided in Section 4.

1.2 Work Plan Format

The Superfund Amendment and Reauthorization Act (SARA) was enacted in October 1986. The current SARA guidance (Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, September 1988) is being followed in the development of the format of this FS/FOU report.

In accordance with SARA, this FS/FOU Work Plan is divided into three phases:

- Phase I: Development of Source Control Alternatives

- Phase II: Initial Screening of Source Control Alternatives

- Phase III: Detailed Analysis of Source Control Alternatives

Also included with this Work Plan is a section defining the schedule for completion of the various tasks in the FS/FOU.

SECTION 2

PHASE I

DEVELOPMENT OF SOURCE CONTROL ALTERNATIVES

2.1 Description of Proposed Response

The first section of the FS/FOU will define and describe the portion of the site which is being addressed. This determination will be based upon data provided in the on-site Remedial Investigation (RI) draft report and evaluations from the Alternatives Array document. Utilizing these data, a site-specific statement of purpose for remedial response will be developed. This response will address the human health risk, environmental impacts, and exposure pathways of concern to the EPA. Additionally, a statement of response will be developed to ensure compliance with the most recent regulatory requirements and guidelines for the Superfund Amendments and Reauthorization Act of 1986 (SARA).

2.2 Identification of Preliminary Remedial Technologies (Task 1)

Following a description of the current situation and the purpose of the response, the FS/FOU will develop a rational screening process that will lead to selection of appropriate remedial action(s) for source control of the Scientific Chemical Processing site. Based upon the known site problems, pathways of exposure, and statement of purpose, the potentially feasible technologies appropriate as source control will be identified. The first step in this process is to identify appropriate general response actions that present a coordinated remedy for source control at the site. Table 2-1 presents a matrix of general response actions that may be considered. A final determination on those actions will be based upon data developed in the RI and the Public Health Assessment (PHA) regarding site conditions, waste characteristics and migration pathways.

Based upon the determination of the potentially applicable general response actions, the next step in the FS/FOU process will be to identify feasible technologies associated with each of these general response actions. Potential remedial technologies that may be associated with each of the applicable general response actions may include, but are not limited to those listed on Table 2-2.

TABLE 2-1

REMEDIAL RESPONSE ACTIONS FOR SOURCE CONTROL
AT THE SCP/CARLSTADT SITE

Response Actions	Sludges	Surface Soils	Shallow Ground Water	Surface Water
No Action	X	X	X	
Containment	X	X	X	X
Lowering Shallow Ground Water Table/ Ground Water Recovery			X	
Complete Removal	X	X		
Partial Removal	X	X		
On-Site Treatment	X	X	X	
Off-Site Treatment	X	X	X	
On-Site Disposal	X	X	X	
Off-Site Disposal	X	X	X	

TABLE 2-2

POSSIBLE REMEDIAL TECHNOLOGIES ASSOCIATED WITH GENERAL RESPONSE ACTIONS FOR SOURCE CONTROL(1) AT THE SCP/CARLSTADT SITE

- No Action or Limited No Action

- Containment

  a) Capping
  b) Slurry Walls

- Lowering of Shallow Aquifer Water Table/Ground Water Recovery

  a) Pumping Wells
  b) Interceptor Trenches
  c) Subsurface Drains

- Diversion of Run-On and Run-Off

  a) Diversion Channels
  b) Dikes/Berms

- Complete Removal

  a) Excavation

- Partial Removal

  a) Excavation

- On-Site Treatment of Shallow Ground Water

  a) Air Stripping(2)
  b) Liquid Phase Carbon Adsorption
  c) Chemical Treatment (e.g., UV/Hydrogen Peroxide)

- On-Site Treatment of Sludges and Soils

  a) Volatiles Stripping
  b) Stabilization/Solidification
  c) Thermal Treatment/Incineration
  d) Contaminant Removal via Solvent Extraction
  e) Vitrification

TABLE 2-2 (continued)

- Off-Site Treatment of Shallow Ground Water via Treatment by a Publicly-Owned Treatment Works (POTW)

- Off-Site Treatment of Sludges and Soils

  a) Thermal Treatment (e.g., incineration)
  b) Contaminant Removal via Solvent Extraction
  c) Chemical Detoxification

- On-Site Disposal of Sludges and Soils

  a) RCRA Vault
  b) RCRA Landfill

- Off-Site Disposal of Sludges and Soils

  a) RCRA Landfill
  b) Pretreatment and Disposal in a RCRA Landfill

- Off-Gas Treatment

  a) Vapor-Phase Carbon Adsorption
  b) Fume Incineration

FOOTNOTES:

(1) Sludges mentioned in this table refer potentially to sludges present in both the pit and the tank located on site.

(2) Air stripping typically must be followed by treatment of the air stripper exhaust (or off-gas treatment), which is listed separately on this table.

Next in the evaluation of source control remedial technologies will be the screening of the initial list of the remedial technologies. The screening will eliminate those technologies that are clearly inapplicable or not feasible as a component for a source control remedy. This screening will be based on site conditions, waste characteristics and technical criteria for remediation. Characterization of site conditions will be based on RI data, ground water and soil characteristics. Technical criteria will include performance, constructability, operation and maintenance, and the status of the technical development of the remedial technologies. Where appropriate, innovative technologies will not be screened out because of a limited record of performance.

To aid in the evaluation and selection of technologies for the remediation of soils, sludge and ground water, a limited scope of treatability studies will be conducted as part of the FS/FOU. A statement of work for these studies has been prepared and is included as Section 4 of this Work Plan.

2.3 Development of Source Control Alternatives (Task 2)

Remedial source control technologies that have passed through the previous screening process will be combined, as necessary, into remedial source control alternatives. Because of the host of chemical compounds present at the site, it is expected that multiple technologies will be required to achieve the desired level of remediation. Therefore, combinations of different treatment technologies and combinations of treatment and containment technologies will be developed in this Task.

In the development of the remedial source control alternatives, the following types of alternatives should be developed to the extent practicable:

- A number of treatment alternatives ranging from one that would eliminate or minimize to the extent feasible the need for long-term management (including monitoring) at a site to one that would use treatment as a primary component of an alternative to address the principal threats at the SCP site. Alternatives within this range typically will differ in the type and extent of treatment used and the management requirements of treatment residuals or untreated wastes.

- One or more alternatives that involve containment of waste with little or no treatment but protect human health and the environment by preventing potential exposure and/or reducing the mobility of contaminants.

- A no-action alternative or a limited no-action alternative, which may include some minimal actions such as fencing, using institutional controls, or monitoring, if no action at all is clearly not viable.

Based upon the data and information developed, as well as the preliminary technology screening, remedial source control alternatives will be developed for further evaluation. Examples of remedial alternatives for each medium are provided in Table 2-3. These alternatives will be further described in Phase II of the FS/FOU. For the final evaluation of alternatives, remedial source control technologies for each of the various media requiring remediation will be combined so that all media identified to be addressed in this FS/FOU are evaluated in the Phase III analysis. If no technologies can be identified which are feasible for remediating one of the types of media, the FS/FOU could conceivably result in the recommendation of an alternative which remediates most but not all of the media.

TABLE 2-3

EXAMPLES OF POTENTIAL SOURCE CONTROL ALTERNATIVES
FOR THE SCP/CARLSTADT SITE

CONTAMINATED SLUDGES AND SOILS: (1)

- No Action or Limited No Action Alternative

- Containment Alternatives

  a) Capping
  b) Barrier Walls
  c) Capping/Barrier Walls

- Off-Site Treatment Alternatives

  a) Excavation/Stabilization or Solidification
  b) Excavation/Thermal Treatment
  c) Excavation/Above-Ground Solvent Extraction
  d) Excavation/Above-Ground Chemical Treatment

- Off-Site Disposal Alternatives

  a) Excavation/RCRA Vault
  b) Excavation/RCRA Landfill

- On-Site Disposal Alternative

  a) Excavation/RCRA Vault
  b) Excavation/RCRA Landfill

- On-Site Treatment/On-Site Disposal Alternatives

  a) Above-Ground Solvent Extraction/RCRA Vault

  b) Excavation/Thermal Treatment/Stabilization or Solidification/RCRA Landfill

  c) Above-Ground Solvent Extraction/Stabilization or Solidification/RCRA Vault

  d) Excavation/Stabilization or Solidification/RCRA Landfill

  e) Excavation/Stabilization or Solidification/RCRA Vault

  f) In Situ Vacuum Extraction/Stabilization or Solidification/RCRA Vault

TABLE 2-3 (continued)

- On-Site Treatment/Off-Site Disposal Alternatives

  a) Above-Ground Solvent Extraction/Disposal in Off-Site Landfill

  b) Excavation/Thermal Treatment/Disposal of Ash in Off-Site Landfill

  c) Excavation/Thermal Treatment/Stabilization or Solidification of Ash/Disposal in Off-Site Landfill

  d) Excavation/On-Site Stabilization or Solidification/ Disposal in RCRA Landfill

SHALLOW GROUND WATER ("WATER TABLE AQUIFER")

- Water Table Control and Ground Water Recovery and Treatment (Via any combination of technologies).

Water Table Control	Ground Water Recovery	Treatment
a) Pumping Wells	a) Pumping to Treatment Unit	a) Air Stripping
b) Well Points	b) Gravity Flow to Treatment Unit	b) Air Stripping/ Off-Gas Treatment[(2)]
c) Interceptor Trenches	c) Induced Flow to Treatment Unit	c) Liquid-Phase Carbon Adsorption
d) Subsurface Drains		d) Chemical Treatment
		e) Treatment at the Local POTW

FOOTNOTES:

(1) Sludges mentioned on this table refer to sludges present in both the pit and the tank on site.

(2) Off-gas treatment may consist of Vapor-Phase Carbon Adsorption, Fume Incineration, or other treatment technology.

SECTION 3

PHASE II

INITIAL SCREENING OF SOURCE CONTROL ALTERNATIVES

3.1 Alternatives Screening Process (Task 3)

Phase II will initially evaluate the remedial source control alternatives previously developed. This phase is an interim screening process prior to the detailed evaluation of the alternatives which will be conducted in Phase III.

The screening to be performed during this phase will evaluate effectiveness in protecting human health and the environment, technical and administrative feasibility, and costs of the remedial alternatives.

The evaluation of effectiveness in protecting human health and the environment offered by each alternative will consider the protectiveness that the alternative will provide, and the reductions in toxicity, mobility or volume that the alternative will achieve. A qualitative assessment of protectiveness may be performed for each of the alternatives as part of this evaluation. Those alternatives which are unacceptable in providing effective protection of human health and the environment, will be eliminated from further consideration.

Those alternatives that do satisfy the environmental objectives without causing unacceptable effects will then be evaluated with regard to their technical feasibility. This evaluation may rely upon the results of treatability testing, technology evaluation as reported in engineering and scientific literature, engineering calculations, past experience and other acceptable means. Those alternatives which rely upon a technology that is difficult to implement, which take a relatively long time to achieve the remedial objective, which have a high probability of failure or which pose an unacceptable risk to human health and/or the environment, will be eliminated.

Only those alternatives that satisfy the environmental and technical criteria will be subjected to a cost analysis. The purpose of considering costs at this time will be to eliminate those alternatives whose costs are significantly higher than others, unless significant environmental, public health, or reliability benefits are realized by this additional cost.

Preliminary cost estimates will be developed with an accuracy range of -30% to +50%. The cost estimates will be based upon block flow diagrams, treatment volumes or flow rates, and other appropriate information developed for each alternative. From this information, cost estimates that rely upon standard cost indices, cost estimates from similar projects, and other readily available information will be developed. Where such information is not readily available for an alternative, as may be the case for an innovative technology, costs will be conservatively developed using best engineering judgment.

Estimates will be developed for capital and operating and maintenance costs of each alternative. These estimates will then be ilized to develop the present worth of the competing alternatives. The costs will then be compared. Alternatives that are an order of magnitude more expensive than their competing alternatives will be eliminated if they offer similar or fewer environmental, public health, or reliability benefits. Competing alternatives that are significantly more expensive but offer substantially greater environmental, public health, or reliability benefits will not be eliminated.

Those alternative remedial actions which remain will then be subjected to a more comprehensive comparative analysis in Phase III.

SECTION 4

TREATABILITY STUDIES

A number of information sources, including journal articles and vendor literature, will be used to evaluate remedial technologies. While sufficient information is available to evaluate a number of remedial technologies, there are certain technologies for which available information may not be adequate to complete their evaluation without treatability testing. In Task 4, Preliminary Treatability Study, three technologies will be evaluated by conducting a limited scope of treatability testing. The studies must be limited due to the short time period available to complete the FS/FOU. They will be performed concurrently with Phases I and II of this FS/FOU.

The studies will assist in evaluating the recommended process options for treatment of soils, sludges (i.e., sludge in both the pit and the tank located on site), and ground water from the shallow aquifer. The technologies investigated in these studies may or may not become part of the remedial alternative(s) recommended at the conclusion of the FS/FOU.

This section lists the objectives of the proposed treatability work, the methods to be used, and the rationale for the testing approach.

4.0 Treatability of Surficial Soils and Sludge

The treatability study for surficial soils and sludge will be conducted in two phases. Part I will consist of the actual treatability tests, while Part II will consist of the comparative analysis, selection, and conceptual design of those technologies (or remedies) evaluated in the study. Part II will also include preparation of cost estimates for completing detailed evaluation of soil and sludge remediation alternatives.

4.1 Program - Part I

4.1.1 Solidification/Stabilization Testing

a. Carry out solidification tests on surficial soils and sludge at the site.

b. Assemble and tabulate the test results.

c. Evaluate the test data to determine the potential for immobilizing the soil/sludge utilizing a solidification/stabilization technology.

d. Select the optimum solidification design mix and processing procedures.

e. Prepare the solidification/stabilization section of the overall treatability study report.

4.1.2 Ex-Situ[1] Extraction Testing

a. Carry out treatability tests for extraction from the soil via an above-ground batch process utilizing water, inorganic solvents, organic solvents and/or surfactants.

b. Assemble and tabulate the test results.

c. Evaluate the test data to determine the potential for remediation via excavation and above-ground batch processing.

d. Select the superior extraction fluids for removal of site-specific soil constituents, and develop the extraction sequence and procedures.

e. Select the superior process for interim and final treatment of extraction fluid.

f. Prepare the extraction section of the overall Treatability Study Report.

4.1.3 Thermal Treatment-Incineration Testing

The scope of this work is laboratory bench scale testing to determine the feasibility of incineration in general, as outlined below:

a. Carry out test burn on surficial soils and sludges from the site.

b. Assemble and tabulate the test results.

(1)Ex-Situ Extraction will involve excavation of materials (soils and/or sludges) and performance of an above-ground extraction treatment remedy on site with redeposition or consolidation of treated materials back to the site.

c. Evaluate the test data to determine the potential for adequate thermal treatment-incineration.

d. Prepare the thermal treatment-incineration section of the overall treatability study report.

4.2 Program - Part II

4.2.1 Compare the relative potential for remediating the surficial soils and site sludges via the three different technologies investigated in Part I.

4.2.2 Select for further evaluation the technology (or technologies) determined to be effective for surficial soils and site sludges treatment.

4.2.3 Develop the conceptual design for the site soil and site sludge treatment technology (or technologies) selected for further evaluation.

4.2.4 Prepare a budget cost estimate for use in conducting the detailed evaluation of soil and sludges remediation alternatives.

4.3 Treatability Study Methods

4.3.1 Solidification/Stabilization Remedy

These treatability studies on chemical solidification/stabilization (CSS) of the surficial soils/sludge will be designed to simulate the chemical reactions that would take place with a CSS process. The studies will consist of sample collection, sample processing, CSS process sample analyses, study data evaluation, and report preparation work elements, as described below.

Sample Collection

After a complete review of the available data on site soil and sludge contamination, sampling locations will be selected to provide representative soil and sludge samples for CSS testing. Locations and depths shown by site data to contain the highest concentrations (i.e., hot spots) will be sampled, as well as a sufficient number of locations to allow the development of one or more composite samples. Soil samples will remain separate from sludge samples, because the optimum CSS design for these two media is likely to be different. Samples obtained from each hot spot will generally remain separate; different hot spot samples will be composited only if site data show that they contain similar types and levels of materials. For soils from areas likely to require a similar design mix, a composite sample will be prepared by mixing samples in proportion to the portion of the total soil volume represented by the individual sample. A composite sample of sludges will be prepared in a similar fashion. The actual soil samples used for the treatability work will be selected jointly by the PRP's consultant and solidification contractors.

Sample Processing

Individual samples of soils and individual samples of sludge will be processed by cementitious, pozzolanic or proprietary chemical processes to determine the feasibility of this remedy. The pozzolanic process is the mixing of alumina and silica-containing materials (pozzolans) and alkaline earth materials (reaction initiators) with waste so that the waste becomes immobilized in a monolithic or soil-like crystalline material. The cementitious process involves the mixing of an alkaline material with a waste to obtain similar results. The study contractors may also test one or more proprietary processes already developed by commercial CSS firms for processing certain types of constituents.

For each process evaluated, a range of chemical additives, and additive ratios (i.e., pounds of each additive per cubic yard of waste) will be employed; one additive mixture and ratio for each performance trial. Separate CSS plugs, or molds, will be made for each additive mixture at each ratio (i.e, each mix design) and subsequently tested for process performance and moisture content. For each ratio, three replicate plugs will be made to facilitate simultaneous testing of potential performance parameters: one for strength testing, one for permeability testing, and one for extraction leachate testing. Each plug will be cured prior to testing. All curing will be done in a sealed environment (i.e., individually wrapped) to prevent drying of CSS plugs or the additional intake of water for hydration. Curing temperatures will be in the range of expected field conditions (10-20°C).

Solidified Waste Sample Analyses

Each design mix that results in a self-supporting mass will be tested for structural strength. A preliminary screening program for a chemical solidification/stabilization (CSS) process would include strength testing, leachate tests, and permeability testing. The interpretation of the results from the above testing will allow a preliminary evaluation of the feasibility for the remedial technology of CSS.

The strength evaluation will be accomplished through the use of one of two tests for unconfined compressive strength (UCS) depending on material type. These tests are:

Cohesive soil-like materials: ASTM-2166
Monolithic materials: ASTM-1633

A testing procedure that will gather data in the most effective method will involve UCS testing of three replicate samples at each of 0, 1, 3, 7, 14, 28 days after mixing. Water content and density will also be determined throughout the testing procedure. This type of sample run will allow the interpretation of mix variability, strength gain over time, and general workability.

Design mixes that require a lower additive ratio to achieve the performance criteria of 50 psi compressive strength will be considered the better designs, and will be selected for permeability and extraction analyses. The selection of the 50 psi strength criteria is recommended because it provides a measure of safety above the 10 psi value that has been demonstrated in field operations to support the heavy construction equipment likely to be used for the in situ CSS process. The solidified mass is not expected to be subjected to loads greater than 15 psi during or after successful solidification.

Permeability values will be generated via triaxial permeability tests, which provide measures of both lateral and vertical permeability, rather than by falling head permeability tests, which only provide a measure of vertical permeability. Lateral permeability is important, because the site contains a shallow ground water aquifer which would be present at the elevations where the solidified mass would be present after processing. Permeability testing will produce an estimate of the potential for water to move through the stabilized material. If the material is relatively impermeable the material would generally not conduct water and therefore would not be affected by leaching. The tests will be run in a triaxial permeameter (flex-wall perameter) and be performed on a three sample replicate after substantial curing has been completed.

EPA will require leachate analysis of design mixes. Analysis of extraction leachate will be conducted on certain selected design mixes that pass the strength and permeability performance criteria to evaluate the reduction in constituent mobility in the CSS matrix. Leachate development will be conducted according to the analytical procedure promulgated by the EPA. Three replicate samples will be tested after substantial curing to evaluate the variability of the mixes.

Study Data Evaluation

Performance data for the design mixes will be compared, and these mixes ranked according to their ability to meet the strength, permeability and leachability criteria. The definition for passage of the leachate test, as applied to potential CSS processing of affected soils and sludges at the SCP/Carlstadt site, will be finalized during this portion of the treatability study, since EPA has not yet promulgated standards (i.e., maximum levels) for extraction leachates. The final definition for passage will be established on the basis of a number of factors including, but not limited to, known characteristics of the site waste, site hydrogeology, potential human receptors and current regulations affecting site remediation and land disposal. Those samples that require a lower additive ratio, reduce soil permeability, and pass the extraction leachate tests according to the definition provided above, will be selected for treatment remedy evaluation.

Report Preparation

The written results of the CSS treatability study will be incorporated into the FS/FOU. The study will include the following:

1. Summary of the basic procedures used to develop the test plugs.

2. Summary of the CSS process performance data, including strength, permeability, and extraction leachate quality for the range of preliminary mix designs, including all designs selected for the treatment remedy evaluation (Section 4.4).

3. Identification of the chemical process (i.e., pozzolanic, cementitious or other) used to develop each of the mix designs for which performance data are reported.

4. Identification of the preferred additive ratio to achieve the performance criteria, including any necessary water additions, as well as the estimated additive ratio for full-scale CSS processing of the waste, as projected on the basis of known waste characteristics.

5. A concise evaluation of the ability of alternative CSS process implementation methods to accommodate the physical and constituent characteristics of the site.

6. Methods to control potential emissions of dust and volatile organics during the CSS process, which is an exothermic process.

7. Recommendations.

4.3.2 Ex-Situ[1] Extraction Testing

a. Bench-Scale Treatability Study (Continuous-Stir Test)

The bench-scale treatability study will consist of soil characterization, soil sample preparation and extraction process performance trials via continuous-stir tests, and extraction fluid treatability tests. The study will be completed by assembling and evaluating the test data, and selecting the optimun processes for extraction and extraction fluid treatment.

Soil characterization will include analyzing a representative number of soil samples for maximum particle size, particle size distribution, pH, humus content and concentrations of specific substances. Soil samples will be prepared as a weight-based composite of all individual soil samples and this composite sample will be analyzed to determine average soil characteristics.

Site soil and control soil samples will be subjected to performance trials for investigating the extraction process. The performance trials will be designed to simulate above-ground extraction via a batch process. Soils will be filtered prior to transfer to the next stage, due to the anticipated effect that a process step has on extraction efficiency.

The performance trials will assist in determining potential extraction fluid or fluids, number of extraction stages, and contact time of each stage.

(1) Ex-Situ Extraction will involve excavation of materials (soils and/or sludges) and performance of an above-ground extraction treatment remedy on site with redeposition or consolidation of treated materials back to the site.

Performance trials will consist of a series of continuous-stir tests designed to determine the effect of the following process variables on the efficiency of extraction: type of extraction fluid, the fluid to soil volume ratio, the number of successive extractions, the sequence for using various extraction fluids (if more than one fluid is used), and the contact time in each extraction stage. Performance trials will be preceded by a chemical analysis of the raw soils and sludge. The procedure for each continuous-stir test is as follows:

1. Fill a flat-bottomed flask with a known weight of prepared soil sample (after grinding and homogenization).

2. Add a known volume of a single extraction fluid of known composition to the flask;

3. Stir the soil/fluid mixture to make a slurry, using a stirring bar/rotating magnet stirrer (or the equivalent);

4. Extract by continuously stirring the slurry for a preselected contact time;

5. Allow the slurry to settle into its soil and extraction fluid phases, and vacuum-filter the soil through filter paper;

6. As a specified volume of spent extraction fluid is transferred out of a selected extraction stage, analyze the fluid and record results in grams removed per kilogram of test material on a dry weight basis;

7. Conduct a number of continuous-stir tests simultaneously in order to compare treatment efficiency as a result of varying a single process variable. Conduct additional stir tests to assist in refining the processing conditions.

b. Treatability Data Evaluation

Performance trials will consist of a series of continuous-stir tests designed to determine the effect of the following process variables on the efficiency of extraction: type of extraction fluid, the fluid to soil volume ratio, the number of successive extractions, the sequence for using various extraction fluids (if more than one fluid is used), and the contact time in each extraction stage. Performance trials will be preceded by a chemical analysis of the raw soils and sludge. The procedure for each continuous-stir test is as follows:

1. Fill a flat-bottomed flask with a known weight of prepared soil sample (after grinding and homogenization).

2. Add a known volume of a single extraction fluid of known composition to the flask;

3. Stir the soil/fluid mixture to make a slurry, using a stirring bar/rotating magnet stirrer (or the equivalent);

4. Extract by continuously stirring the slurry for a preselected contact time;

5. Allow the slurry to settle into its soil and extraction fluid phases, and vacuum-filter the soil through filter paper;

6. Add an equal weight of unextracted soil to the second flask, extract this soil as above and transfer the extraction fluid to the next flask containing unextracted soil. At the same time, extract the first portion of soil with the fluid transferred from the second soil flask, (this fluid has been used to extract the second soil volume). Continue this process of countercurrent extraction for a preselected number of extraction stages.

7. As a specified volume of spent extraction fluid is transferred out of a selected extraction stage, analyze the fluid and record results in grams removed per kilogram of test material on a dry weight basis;

8. Conduct a number of continuous-stir tests simultaneously in order to compare treatment efficiency as a result of varying a single process variable. Conduct additional stir tests to assist in refining the processing conditions.

b. Treatability Data Evaluation

Data derived from the extraction treatability study will include concentrations in untreated soils/sludge, and in samples treated under varying process conditions. Also, for each performance trial a record will be maintained for the type of extraction fluid or fluids, the fluid volume:soil weight ratio, the number of extraction stages, the sequence for using different fluids, and the stage-specific and total contact time for soils/sludge extraction. Data analysis will consist of determining the concentration of each compound removed and percent removals, comparing the efficiencies of various extraction fluids and extraction sequences, and identifying the minimum required fluid sample ratio.

4.4 Feasibility Evaluation

The results of the treatability studies on the in situ CSS process, the above-ground extraction, and the thermal treatment-incineration will be evaluated to determine the potential for three technologies to remediate the surficial soils and sludges. Remediation potential will be defined as a weighted consideration of several factors: percent removals of chemicals (for the extraction process and for the thermal treatment-incineration) or percent reduction in mobility (for the in situ CSS process), required processing time, and number of required process stages. If these technologies are selected for the development of source control alternatives, they will be further evaluated via detailed analyses, cost and regulatory compliance analyses in accordance with Section 5 of this Work Plan.

SECTION 5

PHASE III

DETAILED ANALYSIS OF SOURCE CONTROL ALTERNATIVES

5.1 Alternatives Evaluation Process

Each source control alternative that passed the initial screening conducted in Phase II will be given further definition and individually analyzed for the complete remediation of on-site soils (above the clay layer), sludges, and shallow ground water. The sludges to be addressed include the pit sludge (estimated to be approximately 2,000 to 3,000 cubic yards) and the tank sludge (estimated to be approximately 10 cubic yards). The definition for each alternative will identify which specific technologies will be considered for the remediation of each type of media, and will describe how these technologies will be combined to produce the full alternative.

Source control alternatives will be individually evaluated based on a number of information sources including, but not limited to, journal articles, vendor literature, and professional experience. Evaluation criteria will include those identified by EPA in the Interim Final Guidance Document dated September, 1988, as important to the selection of a site cleanup remedy.

The EPA criteria for this detailed analysis of source control alternatives, pursuant to the latest RI/FS guidance, are as follows:

- Short-term effectiveness
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Implementability
- Cost
- Compliance with ARARs
- Overall protection of human health and the environment
- State Acceptance
- Community Acceptance

Note that the criteria of State Acceptance and Community Acceptance will not be considered in detail in the evaluation of alternatives. A detailed evaluation of the last two criteria, State Acceptance and Community Acceptance, will be postponed until the solicitation of formal public comment.

The above evaluation criteria are defined in terms of specific factors and effects which allow for comparisons between source control alternatives and identify the relative strengths and weaknesses of each by comparison. The nine EPA evaluation criteria are defined and presented below for this feasibility study.

5.1.1 Short-Term Evaluation

Each source control alternative will be addressed in terms of the extent to which it can mitigate short-term exposures to on-site chemicals during remedial actions and until cleanup goals are achieved. This evaluation will focus on:

- the degree to which existing site risks are reduced;
- possible short-duration risks borne by the cleanup workers and the nearby community, or possible adverse effects on segments of the environment (such as Peach Island Creek) during implementation of a remedial alternative, including potential risks associated with excavation, transport, storage, and treatment/disposal of site media;
- the duration of the remedial action required to reduce site risks to human health and the environment to acceptable levels.

5.1.2 Long-term Effectiveness and Permanence

Each source control alternative will be assessed on its effectiveness in minimizing or reducing long-term exposure to any residual material associated with the site. This evaluation will focus on:

- the magnitude of risk posed by residual material remaining after implementation and completion of a remedial action;
- the compatibility with remedial alternatives potentially implemented for other portions of the site;

- the type and degree of long-term site management required, including monitoring, operation and maintenance, and site security;

- the long-term reliability of proposed technical and institutional controls on the movement and migration of waste residuals, and on the potential for recontamination of remediated site media from off-site sources and phased cleanup efforts.

5.1.3 Reduction of Toxicity, Mobility and Volume

Each source control alternative will be evaluated to determine the extent to which it can reduce the volume or area, minimize or prevent migration, and reduce the toxicity of site materials. This evaluation will focus on:

- the treatment processes to be employed and the wastes/ media that are to be treated;

- the degree of treatment provided in terms of amounts destroyed and/or permanently altered;

- the permanence of a treatment process, considering the potential for future mobility or toxicity effects of treated materials;

- the residuals remaining after treatment, considering their persistence, toxicity, mobility, volume and tendency to bioaccumulate.

5.1.4 Implementability

This evaluation will focus on the possibilities of off-site treatment/disposal, the constructability and installation of focused source control alternatives on-site, and the time required to remediate or complete the cleanup action. It will address issues concerning on-site/off-site placement, equipment availability and limitations, time to complete performance tests, construction duration, and time to operate. The following factors will be considered:

- degree of difficulty associated with constructing and/or installing/arranging the remedy;

- expected operational reliability and control of the remedy;

- need to coordinate and obtain necessary regulatory approvals and permits to design, conduct/construct and operate a proposed remedy;

- availability of necessary facilities, equipment, chemicals and specialists for a particular treatment measure;
- the relative ease for undertaking additional remedial actions for achieving a cleanup objective or for remediation of site media beyond the source areas;
- ability to monitor the effectiveness of a remedy in operation and the residual content following completion of a remedial action.

5.1.5 Detailed Cost Analysis

The evaluation of costs for the source control alternatives will focus on the following:

- capital costs;
- operation and maintenance (O&M) costs;
- net present worth of capital and O&M costs; and
- potential future remedial action costs.

These estimates will have a target accuracy of -30 to +50 percent.

Consistent with conventional cost estimating practices, separate estimates will be prepared for capital, and operation and maintenance costs. Capital costs include direct costs associated with the following:

- construction labor, equipment and materials,
- process equipment,
- site development,
- control building, utilities, and services,
- relocation/evacuation, and
- disposal of wastes, including transportation.

Capital costs also include indirect costs associated with the following:

- engineering expenses for administration, design, construction supervision, drafting, and testing of remedial alternatives;
- legal fees, licensing, and permit costs;
- start-up costs; and
- contingency allowances to account for unforeseen circumstances such as adverse weather conditions, labor problems, or new site information that affects the schedule for implementation.

Operation and maintenance costs are the costs that ensue after construction to carry out the remedial action. These costs include the following:

- operating labor costs, including wages, salaries, training, overhead and fringe benefits;
- maintenance materials, labor, and equipment;
- auxiliary materials and energy such as chemicals, fuel, water and sewer service, etc.;
- purchased services for sampling and analytical requirements and professional service;
- administrative costs;
- insurance, taxes, and licensing costs such as permit renewal and reporting costs;
- rehabilitation costs for maintenance equipment and/or structures; and
- other costs.

Cost information will be obtained from vendor estimates, from costs calculated for similar alternatives considered for other sites, from EPA costing documents, and from standard cost estimating guides such as the "Means Guide" and "Dodge Guide". Costs for innovative technologies will be based on best engineering judgment when other cost information is not available.

The present-worth analysis will be developed using the current EPA-based discount rate of 5 percent. The period of performance used in the analysis will not exceed 30 years, although some of the anticipated remedial alternatives for this site may have an operating requirement that is longer than 30 years.

Where applicable, the necessity of replacing the selected remedial alternative will be evaluated.

5.1.6 Compliance with ARARs

An evaluation will be conducted to determine the potential for each source control alternative to attain legally applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental and public health laws. The basis of the evaluation will include whether chemical-, location- or action-specific ARARs can be met or closely met by the alternative under consideration.

Although ARARs will be used as a goal for remediation of the site, consideration will be given to the circumstances in which ARARs may be waived. The waivers provided by CERCLA (121) (d) (4) (A) are:

i. The remedial action selected is only part of a total remedial action that will attain such levels or standard of control when completed.

ii. Compliance with such requirement at the facility will result in greater risk to human health and the environment than alternative options.

iii. Compliance with such requirements is technically impracticable from an engineering perspective.

iv. The remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria or limitation through use of another method or approach.

v. With respect to a State standard, requirement, criteria or limitation, the State has not consistently applied (or demonstrated the intention to consistently apply) the standard requirement, criteria, or limitation in similar circumstances at other remedial actions.

5.1.7 Overall Protection of Human Health and the Environment

Source control alternatives for remediation of sludges, surface soils, and the shallow ground water that have been retained through Phase II screening process will be assessed as to whether they will provide adequate protection of human health and the environment. Exposure to remediated site soils and sludges as well as the potential for migration of residual contaminants from the remediated soils will be considered in this assessment. A risk assessment will be performed to determine the residual risk associated with exposure to site soils and sludges.

5.1.8 State Acceptance

The assessment will evaluate the technical and administrative issues and concerns which the state of New Jersey may have regarding each of the alternatives.

5.1.9 Community Acceptance

The assessment will incorporate public input into the analysis of alternatives.

5.2 Preliminary Report

A Preliminary FS/FOU that encompasses the three SARA phases of the FS and recommends appropriate source control measure(s), will be provided to EPA and other regulatory agencies for review.

This report will be formatted as follows. Technologies to be evaluated for use at the site will each be evaluated individually against the requirements described in Section 2.2 of this Work Plan. An end-of-section summary indicating which technologies have been retained or discarded will be provided. Preliminary screening of source control alternatives and/or combinations of the alternatives derived from the retained technologies, will be performed using the criteria given in Section 3 of this Plan. An end-of-section summary for this evaluation will also be provided. An evaluation of the retained source control alternatives in combinations will be conducted against the nine evaluation criteria discussed in Section 5.1 of this Plan. A summary of this evaluation will be provided in a separate subsection following the detailed evaluation of alternatives. This summary would include tabulated results of the detailed evaluation and would also contain, if appropriate, a discussion of trade-offs among similar alternatives. This summary section would be organized to permit comparison of each alternative against others for all nine criteria described in Section 5.1.

5.3 Final Report

A Preliminary FS/FOU Report including a recommended remedial alternative, will be submitted to EPA. EPA will review and comment on the Preliminary FS/FOU Report. Within 15 days of receipt of written final EPA comments on the Preliminary FS/FOU Report, the Report will be modified as may be necessary to conform with such comments and submitted to EPA for approval, and/or additional engineering evaluations as EPA finds necessary will be initiated.

SECTION 6

PROJECT SCHEDULE

The duration for this focused approach to the FS/FOU for remediating surficial soils, sludges and shallow ground water is four months. It is anticipated that the FS/FOU effort will be initiated on 5 December 1988 and be completed by submission of a Preliminary FS/FOU Report on 1 April 1989 to USEPA Region II.

The proposed schedule includes performance of necessary tasks: to evaluate and screen technologies and process options, to develop alternatives which typically combine one or more feasible treatment technologies, to conduct limited but appropriate treatability tests, to screen the feasible field of alternatives to select the most effective and protective remedial alternatives, and to analyze these selected alternatives in detail to provide a basis for comparison and decision making. The remaining task is to generate a report to document the above sequence of feasibility study evaluations and analyses, and to present the most appropriate alternatives in terms of the degree or extent that they satisfy the evaluation criteria.

The development of alternatives will follow the evaluation and screening of technologies in Phase I. At the completion of Phase I, an Interim Status Report for the FS/FOU will be issued to the EPA. At this time, drafting of the FS/FOU report will be initiated to document and highlight the Phase I activities.

The Phase II effort will follow immediately and cover a minimum time period to accomplish the evaluation and screening of source control alternatives and/or combinations to select a limited number of alternatives for the detailed analysis. Again, appropriate FS/FOU report sections will be drafted to cover the Phase II evaluation. At the completion of Phase II, a second Interim Status Report for the FS/FOU will be issued to the EPA. The results of the treatability studies will be incorporated for review as the results become available.

Finally, Phase III will involve detailed analyses to complete the FS/FOU process and assembly/critique of a draft of the Preliminary FS/FOU Report beginning after the treatability and Phase II efforts are completed. Interim Status Reports submitted to EPA at the conclusion of Phase I, II and III will contain a detailed description of all work performed during each phase, and the written results of all work performed during each phase.

The Preliminary FS/FOU Report will be delivered on schedule to the USEPA by 1 April 1989.

FIGURE 6-1
SCP CARLSTADT
FEASIBILITY STUDY/FIRST OPERABLE UNIT
PROJECT SCHEDULE